




Chelmsford Amateur Radio Society

Newsletter

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Next meeting: 6th December - 7.30pm, Oaklands Museum

Christmas Social Evening

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Club Nets - Tuesdays 20:00h
Net Controller: TBD

#2 - GB3DA	13th December
#3 - GB3ER	20th December
#4 - 80m	28th December
3.756MHz	
#5 - 160m	n/a
1.947MHz	

Essex Ham Net
Mondays 20:00h GB3DA



Contact details for the newsletter: editor@g0mwt.org.uk

Editorial

Hello again, and welcome to the latest edition of this newsletter. This will be coming out a little early, but it's appropriate to wish the readership compliments of the season.

After the last Newsletter was distributed, I got this in my inbox: *"Just skimming the November 2016 newsletter, I read 'The new ... has now been chosen and installed', and my mind idly thought about bolting it/ them down, connecting to supplies (110V? 220V? DC?), and so on. Then I looked again to see what had been acquired, and saw that what had actually been selected was the committee. I still envisage them being fixed into place and connected to supplies, though they are more likely to run on tea, coffee, or something stronger, than volts 😊! - John, G6JPG"* It's nice when folks see the funny side of things!

Earlier this year Keith Haynes, G3WRO was co-opted to the position of Regional Manager for the RSGB (Region 12). Colin, G0TRM tells me Keith will be coming along on Club night with Deputy Regional Manager Vic Rogers, G6BHE to introduce himself and give just a brief (10-15 mins) outline of what changes have been made in Region 12 over recent months.

My new PC continues to give me grief. I don't do an awful lot of graphics processing but there are some specific functions I find I need to use whilst publishing this work. I have a copy of PaintShop Pro X that ran entirely happily under Windows 7 but suffered from some formatting quirks at the application's startup screen when it asked you to register under W10. I always skipped that stage and once running, it seemed to work perfectly under W10. I had previously registered the software and didn't see the need to re-register it, but finally got fed up with avoiding the startup screen and used the app's inbuilt registration routine. That was when the program stopped working. Neither could I uninstall it.

I contacted Corel who said it was my fault as version X is not compatible with W10, but that I could upgrade to the latest PSP X9 for £20. That was acceptable so I asked for help in uninstalling PSP X. "Just delete x,y,z directories" they said. Well that wasn't going to work and, of course, it didn't. Naturally, the OS still thought the software was installed and cleaning out the freshly disassociated entries from the registry didn't help at all. I tried re-installing it over the top of the old one and that was no good either. At every one of these stages, the install/uninstall software just hung. I tried to uninstall it manually under the command line. The uninstall files sit in a folder that is hidden (you can only see it using the command line - even viewing hidden files will not reveal it under the Windows GUI) and found it was something to do with ownership permissions, so then I used a program called "Application Mover" by Funduc Software. I got the software to move PSP X to my downloads directory and then tried the uninstall again. This time it worked perfectly; PSP X9 is now happily running and PSP X is no more.

It's nice when you win occasionally, isn't it? - **Ed**.

Dates for your diary

Please note: the dates may be subject to change...

Tue. 6th December	Meeting - Christmas Social Evening & RSGB representatives chat.
Mon. 19th December	No Skills Night! - everyone will be taking it easy...
Tue. 3rd January	Meeting - Riding the radio waves - Jane Humphreys
Mon. 16th January	Skills Night - Danbury Village Hall
Sun. 5th February	Canvey Rally - Paddocks Community Centre, Long Road, SS8 0JA
Tue. 7th February	Meeting - Talk on Diplomatic Wireless - by Peter Grimshaw, M0HSG
Tue. 7th March	Meeting - Classic Computers - Andy Chapman, G7TKK
Tue. 4th April	Meeting - RF Kits Design & Manufacture - David Powis, G4HUP (hupRF.com)
Tue. 2nd May	Meeting - Tricks with Coax - John Regnault, G4WSX
Tue. 6th June	Meeting - table top sale
Tue. 1st August	Meeting - Constructor's competition

It's that time of year again!

Yes, it's the **Christmas Social** at CARS. All the usual favourites will be there. The talks, the quiz, the food and festivities. Maybe there will be some entertainment; who knows? I don't have an agenda as I write this, but whatever happens, just treat it as a nice surprise.

There will, of course, be the famous CARS mince pies, personally researched and served up by CARS' own favourite Hostess Trolley Dolly - John, G8DET.

Whether they will look anything like the pictures here is anyone's guess, but when I **Googled** "mince pies" I got this advert::

*Discover Our Classic **Minced Pie** Recipes This Christmas. Visit **Schwartz Now!** Quite why anyone*

would want to mince a pie is open to question, but each to their corporate own, I s'pose.



Also, **Waters & Stanton** appear to be having an open day on Saturday 10th December between 10 a.m. and 4 p.m.

There will be local groups attending, including CARS Training, Essex Repeater Group and Essex CW Club.

The local call G0PEP will be available for use and you will be able to sample and operate a range of equipment.

If previous years are anything to go by, you should also be able to sample yet more mince pies, along with a range of other nibbles. It seems strange that we haven't had a flyer on the subject. I wonder why.



November Skills

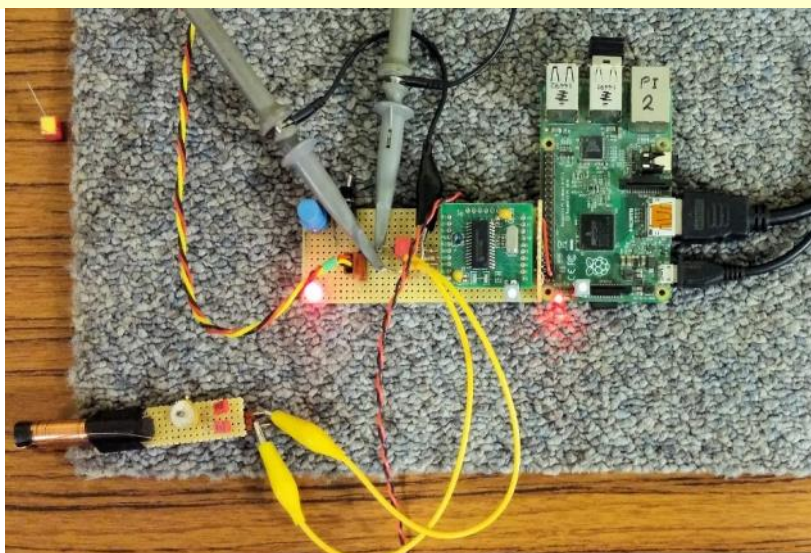
Last event this year, but definitely not the least, was the ever-popular November Skills event. It is the "most least" event that is held locally on a regular basis. The range of attendees, the variety of demonstrations and the sheer good-natured enthusiasm shown by all (and that includes the normal kitchen crew of David, Myra and Anne) go to make this a most enjoyable evening. This event was no exception, with a good attendance on a rainy night, and a range of displays that contained yet another surprise: Graham, G8HAJ's Hellschreiber, on 472kHz, powered by a Raspberry Pi. Shown here is the kit configured to display the sending message on an HDSDR waterfall display. Very clever, and well worth further investigation. Thanks to Pete for organising this display and Graham, for his first time at this event, must have been very pleased with the interest that was shown in his efforts. Well done, indeed.



I didn't get a chance to talk to Graham; one of the penalties of having to do two things at once at this event, but I would love to have had an explanation of the "fuzzy" mode he talked of in his introduction.

Seen here, lower left in the picture, is the receiving antenna that was coupled to the transmitter a short distance away on the same bench. The antennas were small pieces of ferrite rod wound over with copper coils. The data was then processed by the Pi and sent to the display.

Mike, G4NVT had brought along his analyser that he uses to impress most who see it. He had built a crystal filter after a design published in RadCom and that he had found some difficulty in adjusting. Ed, G8FAX brought it over to me to put on my analyser.



I fired it up, but I hadn't used that with my laptop since the last Skills and found that I was getting error messages. Then it dawned on me that there had been a major media update in the interim and the audio codecs had to be reset. Never mind - normal service was resumed after a short delay and a re-calibration and all was again well. A quick connector re-configuration allowed Mike to see that his filter did, indeed, work after all and restored his confidence.



Oliver, M0WAG was trying to get his head around transferring the EQSL ADIF files from PC to memory stick and the Essex CW club in the guise of Rob. M0KCP and Dean, G4WQI were again on hand to demonstrate live how CW QSOs can cut through the QRM that is consistent with a room full of electronic equipment, effectively co-sited with the antennas.

Rob wanted some help with wiring his keyer but, unfortunately, we didn't have the right plug or ideal screened lead wire on hand to complete the job. Sorry Rob! Must try harder next time...





The M6 corner was there for just that: M6's or those thinking of or about to take their Foundation licence.

Advice and answers were on being given out like sweeties and Mick, M6NFE was both engaged and engaging.

Pete, M0PSX was, of course, considered a fitting MC for the evening, chatting to the punters and offering advice on his beloved digital modes whilst Sarah kept attendance records and flitted about taking photos for a different kind of record.

Most fittingly, Ed, G8FAX proposed a vote of thanks for the work that Pete and Sarah both do in promoting



and facilitating the event - a vote that was thoroughly endorsed by those present with a huge round of applause. As Murray, G6JYB brought up in the Quiz, it is the end of the third year now, with 33 meetings having been held and 2017 sees the fourth year begin. Let's hope that the next round is as good, or better than the last.

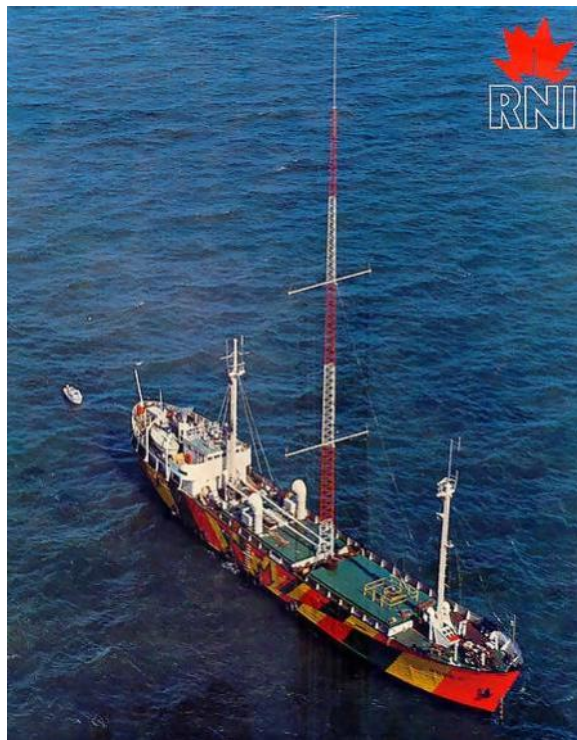
On that note, I have to say that I have sometimes found it frustrating not being able to get around to see and talk about all I would like to, and, possibly, not being able to explain fully to some of the attendees in sufficient detail because of time or space constraints. Better, though, for it to be that way (leave them wanting more?) than for the event to be held at some other time and for slightly too long? Dunno. If it ain't broke, don't fix it and it certainly works! Thanks to Murray for some of the pix here and thanks, Pete for your efforts. - **Ed**.



CARS November Meeting: A Trio of Talks

A new approach to Club meetings was tried out at the last CARS meeting; instead of a single speaker we had three. Three for the price of one as it were. The idea had been on the programme listings for some time as '25 minute chats'. With John Bowen, G8DET acting chairman for the evening setting the scene with some interesting titbits, it was time for our first speaker, club member Jim Salmon 2E0RMI, well-known for his local broadcasting activities.

Jim began by telling us about himself and his main interests. He has been a radio amateur for some 10 years to date, but with a liking for all things radio, his interest goes back many years before that, starting as a thirteen year old in 1970. He started his talk by showing a picture of an early pirate radio ship and asked if anyone knew its name, (no one did; no marks there) it was the Mebo II of Radio North Sea International. Jim gave us a detailed account of the life of the ship which started in 1970. It had a colourful life, one time catching fire after being bombed and putting out a Mayday call for help on the MW broadcast band at 100kW. It eventually moved to Libya; its final fate being used for target practice by the Libyan Air Force. Jim went on to describe various ship-borne aerials and masts that have been tried, although not always successfully, in particular the circular loop aerial attempted by the ship-borne Capital Radio.



He remembers as a youngster at boarding school in the 70's the early days of RNI & the returning Radio Caroline, and told of its history. His interest continues to this day. After all these years the name Caroline lives on in a somewhat different guise - still broadcasting, but now sending out music streams on the 'net.



Jim has spent many hours on both sides of the microphone, starting in a small way in his youth with friends at school and a station they called 'Mike Tape 2' as they had only one microphone and two tape recorders! Jim pointed out that this now seems an interesting letter/number combination, MT2, albeit in an unusual order, and wondered if his interest in radio was coincidence or maybe more. He recalled Radio Orwell opened on his 18th birthday, and his top 5 records were played on that day. More poignantly, he discovered that the official date given for the opening of the BBC Empire Service (which became the World Service) is 19th December 1932. This just happens to be the exact date and year on which his mother was born. Another coincidence?

More recently he has been involved in so called Community Radio projects. Between 2001 and 2007 he broadcast 4 RSL (restricted service licence) stations and a short-lived full time community station with material usually directed at the older generation, from the 20's to the 50's (dates, not the people!) In 2004, an About Anglia TV news item broadcast showed Jim in full flow in his home studio using the now well-known title "Chelmsford Calling".

RSLs are now very expensive at a prohibitive £4500 for a four week period, and community radio is an exhausting and time consuming process, so when Jim recently looked at returning to broadcast radio he decided to use some of the short wave relay stations now available to amateur broadcasters, including WRMI in Miami. Radio Miami International uses a 100 kilowatt transmitter, just a little more power than he has used in the past, and resulted in signal reports from all round the World.



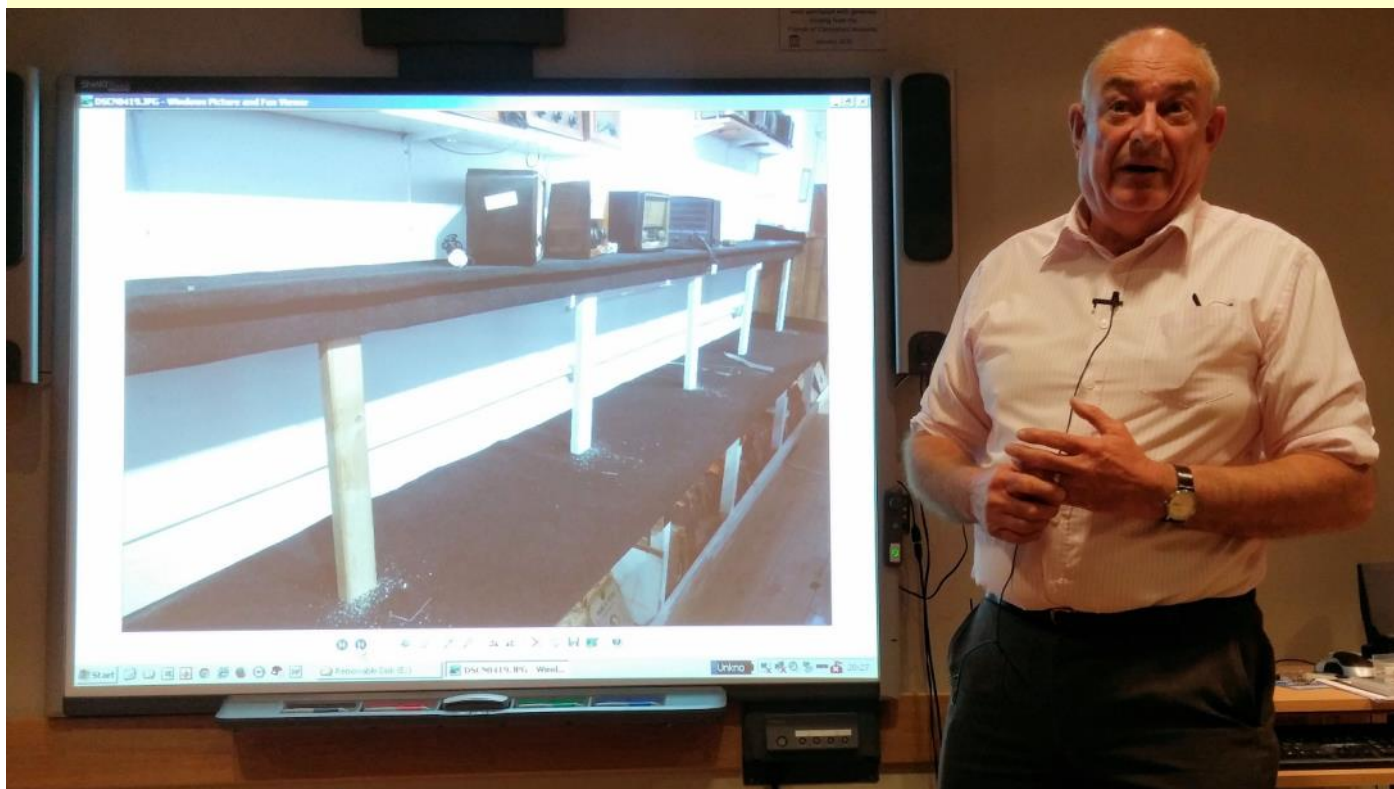
On a continuing radio theme Jim's next project is to acknowledge the early days of broadcasting in England by celebrating 95 years since Marconi engineers began it all in a wooden hut at Writtle. Inspired by Tim Wander's book '2MT Writtle The Birth of British Broadcasting', Jim has plans afoot for a series of internet broadcasts under the title of Radio Emma Toc, running alongside a CARS special event station using the callsign GB952MT. Two dates have since been highlighted in the Club events program, Sunday 12th and Tuesday 14th of February 2017. The 14th will be the 95th anniversary of the first broadcast using the call 2MT (2 EMMA TOC) created by now famous people such as Peter Eckersley, Sir Noel Ashbridge and Rowland Wynne. For further details see Jim's web site: www.emmatoc.com

Jim earlier talked about the AM broadcasts of the BBC World Service on 648 and 1296 kHz with 500kW from the now sadly defunct transmitter-less Orford Ness site. All that remains there now are the five 350ft aerial masts, recently seen from Aldborough by the writer. However, the World Service continues 24 hours a day and can be heard on the net and for some four hours during the night on Radio Four's FM frequency. (*Listened to with 'frequency' by the writer*).

Having answered a number of questions Jim passed the microphone to David, M0HBV for part two of our trio of talks.

David's talk was a fitting follow-up to Jim's from the AM and MW points of view as he began by explaining his interest in broadcast radio sets of yesteryear and they were shown in plenty in the many fine pictures he had. David explained that he had been asked to repair a radio that was to be used as a prop for TV production. It seems that producers want the sets to be in working order - even if they will not be switched on at any time during the programme. Not only radios, but television sets have also passed through his workshop, been given a new lease of life and then appeared in current TV series.

David went on to explain about his interest in The Sounds of the Past Museum at Monks Eleigh near Sudbury in Suffolk. He showed us many pictures of the now large display area. It was not always thus; it began with a local collector some years ago, starting in a small way, but which quickly escalated until he had two sheds full (and more) and asked for help to house it all. By good fortune a local United Reform Church became available on a long term rent free basis and the museum was born.



Initially, and for some time, the shelving and general display area was in very poor condition and needed a rethink. After much work the shelves are now all nicely carpeted and like items are displayed in large organised manufacturers groups. Row after row of, not only radios and televisions, but video recorders, record players (mainly Dansette it seems) tape recorders, cameras, projectors, crystal sets, accordions, electric organs and so on.

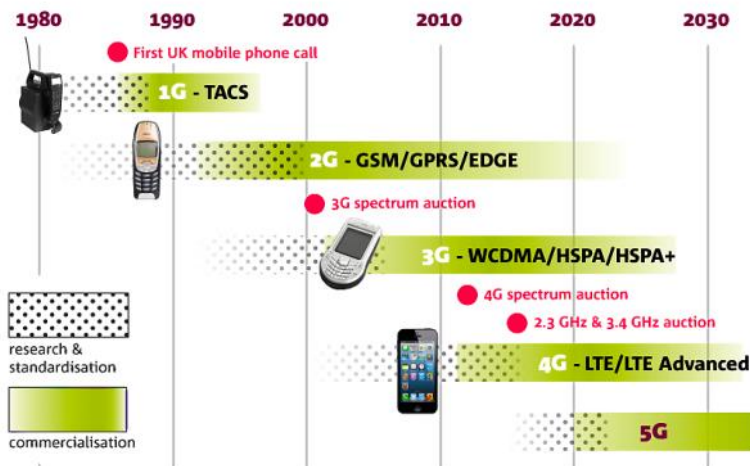
It seems if it made a noise or had a picture on the front of it, it has found a place in the Museum. Most of the exhibits are in working order and David has and does play a major role in looking after the insides of the sets. A whole series of TV sets are in working order. One, in particular, is thanks to David's work, which he rebuilt practically from scratch. A complex television signal distribution network has been established and up to twenty four sets can be live at any one time. Using an Aurora 625 to 405 line Standards Converter it is possible to see up to date programs and videos on past date TV screens. On the first Sunday of the month a local organist comes in to keep electronic organs warmed up and to entertain the visitors. It is well worth a visit.



Picture courtesy of YouTube

The Museum is open on the first Sunday in the month and entry is free, but a donation to the chosen charity would be very much appreciated. The Museum does not as yet have its own website but, nevertheless, there is much to be seen at <http://www.bbc.co.uk/news/uk-england-suffolk-30476959> and at <https://www.youtube.com/watch?v=Y5QAWWS4Y1E> and <http://www.letstalk24.co.uk/articles/sounds-worth-a-visit/>. And there are more 'Sounds of the Past'.

After numerous questions were answered by David it was time for refreshments and a cake or two. After the break it was time for third talk and for Murray, G6JYB to tell of some sounds of the future and to enlighten us about '5G'.....the Fifth Generation of Mobile Communications. Murray began by showing a few slides on how forthcoming fifth generation (5G) mobile comms was aiming at unheard of data rates and frequencies (including some TV and amateur ones) using smart antenna arrays that could create massive MIMO; although at the expense of TV and Amateur spectrums.



Relating some history, he said the first 1G TACS phones were like bricks. Then 2G-GSM was made a success by the likes of Nokia handsets, text messaging etc. Nowadays smartphones have evolved on the back of 3G and 4G data rates and internet access, although coverage remains an issue.

The next step, 5G (aka IMT-2020), is based on new antenna technologies and frequency carriers that can offer orders of magnitude increases (though it is not always clear what you might

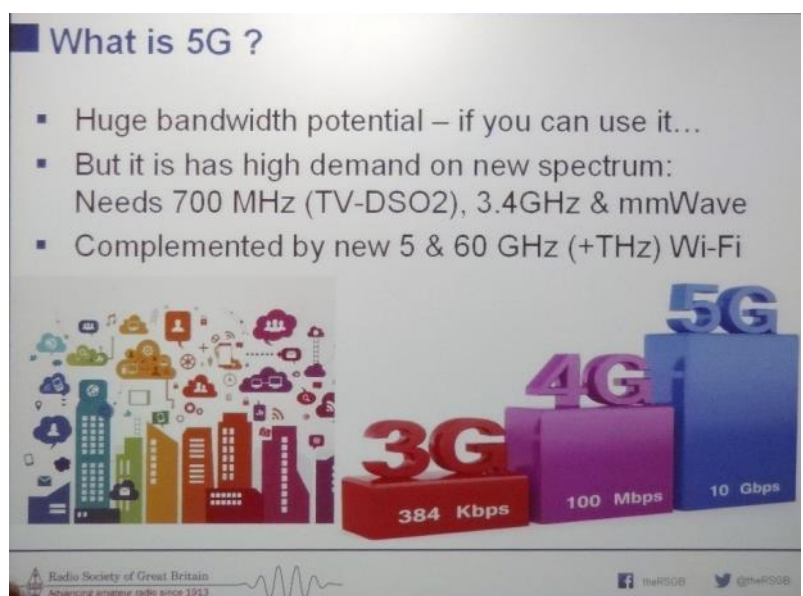
need it for!).

Significant new blocks of radio spectrum are needed for 5G as follows:

- ♦ UHF: 700 MHz TV clearance/switchover starting in July 2017 (affecting some HD services and aerial groups) for long range/rural use
- ♦ 3.4GHz: A large block at 3.4-3.6GHz (and perhaps 3.6-3.8GHz as well) for mainstream
- ♦ mmWave: First time use of SHF/mmWave frequencies (tbc at WRC-19 but in the range 24.25-86 GHz)

The latter ones in particular provide multiple Gigabit capacity for crowded public spaces such as stations/airports, stadia etc.

One of the enabling technologies for this has been the advent of low cost CMOS chips that can operate at mmWave frequencies (first developed in 2007 for 60 GHz Wireless-HD links for TV and Blu-ray players). The other innovation is the use of multiple antennas and large-scale MIMO for beam forming. Murray had pictures of a number of current 3.5GHz MIMO demonstrations, up to 96 antennas. Whilst the theory and engineering does work, it ultimately is limited by what can fit a handset - at low cost. Unlike the more basic MIMO on home Wi-Fi this can serve far more users and can actively manipulate the wave fronts to track mobile users.



One of the first impacts of 5G will be the preparatory changes to Freeview TV in order to clear the 700MHz TV channels for sale, so we look forward to a future update by Murray on that, as it may mean more retunes and a reduction in high-definition coverage in Chelmsford from Crystal Palace (and new aerials in Kent). My thanks to Murray for allowing me use of his script.

My personal thanks to Jim, David and Murray for their excellent contributions. When the 25 minute talks idea came up Murry volunteered and Jim & David readily agreed to talk when I asked them later. I think it was a very good evening; well worth repeating and already entered into our talks programme for later next year. We have at least one volunteer to date for our next 'three-in-a-row'.

Colin, G0TRM

Morse Classes

Thursday 5th January, 2017, Danbury Village Hall, 7pm - **PUT IT IN YOUR DIARY NOW!**

Our friendly classes enjoy an evening of Morse code, from the complete beginner to the operator who just wants to improve his skills.

In 8 weeks - if you do your homework - we will cover all the letters, figures and characters used to enable you to get on the CW portion of the bands. Bring your Morse key if you have one, a pen and A4 sized book.

See the Chelmsford Amateur Radio Society web page - you do not have to be a CARS member.

Andrew Kersey, G0IBN (Details on QRZ.COM)

Sandford Mill Discovery Day

I didn't get to see much of the action this time around, as I had gone along with Mara to get another look at that lovely water purification plant. I do hope that they manage to do something with it; it's too good a space to be allowed to rot.

Anyway, I gather that a replacement SG231 ATU and feeder was installed by Tony, G4YTG after John, G8DET and I did a dry run with his SG230 and found that it matched the open feeder adequately. Good stuff. I have no report on the operating conditions, but I assume it was OK.

Dean, G4WQI was operating with Chris, G0IPU logging when I went along and Murray, G6JYB had his digital displays up and running again. The place was swarming with visitors, which must have pleased Tim Wander and I hope plenty of interest was shown.

Colin, G0TRM had done a good job with his Morse displays upstairs and there was plenty of interest in his mechanical sender. - **Ed**.



Snake oil

Colin, G0TRM sent me a link to an audiophile website that was selling gold/silver “HiFi tuning fuses” and that makes great claims for their effectiveness. Indeed, there is a quote from a user who claims to be an electronic engineer with 15 years experience (wow!) in the industry: *“I did not say no this cannot be possible as many people do, I thought I have heard stranger things in this industry and went and purchases a Hifi-Tuning fuse for my Stax 006t headphone amplifier thinking if it made a difference there I will defiantly hear it through these earspeakers (sic).”* Quite. They are also agents for Schiit Audio... At £48 each, they must be a bargain <http://www.electromod.co.uk/hifi-tuning-fuses.asp>.

There is another site Colin mentions which sells items that perform similar magic tricks: <http://marigoaudio.com/>. You can get “tuning dots”; self adhesive pads of 3, 4, 6 or 40mm diameter that you can stick to things like speaker cones and/or cabinets, windows etc. What’s more, you can pay anything up to \$79 for a set. You could also choose a CD mat; at only \$239 it claims you could have improved bass articulation, slam & extension, improved coherence, pace, rhythm & timing, improved low level linearity etc., etc. Don’t they know how a CD player works?

It reminds me of the early days of CDs when (previously) respected audio reviewers were saying that by putting two CDs into the player, the likes of wow and flutter were reduced and other spurious claims were made. It’s a shame that those reviewers were also unaware of how a CD player worked: the speed of the disc varies as the data is read from the centre to the outside - quite the opposite of the old vinyl days - as the data is laid down to the disk at a constant rate, the track speed must vary in order to maintain a (relatively) constant distance between bits. When the CD is played back with imperfect mechanics (and often cheap - even in expensive gear), there will inevitably be some variation in data rate so the data is read into a buffer and then clocked out at a constant rate; the notion of wow and flutter in a CD player is not only nonsense, it should more accurately be referred to as clock jitter (if you think your ears are up to picking that one out!) It makes me sad that there are people out there who fall for these trick claims.

Relevance

It doesn’t only apply to HiFi of course. There are a lot of false claims made for all sorts of things in the amateur radio world - especially in the field of antennas. Almost the first thing we learn about radio is the importance of matching feeder impedance to antenna and this is, perhaps, the most misunderstood and/or widely abused rule of achieving successful and efficient operation with any given antenna. I’m constantly surprised at the number of people who either demonstrate a deep lack of understanding of the subject or dismiss it with statements like “my rig has an internal ATU—it matches up to 3:1 SWR so I don’t have a problem matching the antenna”.

A SWR of 3:1 represents a return loss of 6dB. That says about half the transmitter power is being returned down the coax; another half of it is lost on the way back, so about 25% is returned in total, which can be out of phase with the original signal depending upon the frequency and length of coax. The impedance as seen by the Tx is not ideal and it cannot, therefore, load full power into the antenna system. The rig’s internal (or any other external) ATU will match the impedance seen looking into the coax so that the transmitter is then happy to put out its full power into the load - if the SWR can be reduced to 1:1.

That power is then presented to the coax which then is able to put more power down to the antenna, but reflections will still occur and the antenna still cannot output as much power as if it were matched. In the case of the example 3:1 SWR, you would see 1.25dB mismatch loss (~25%), voltages of up to 3x the nominal and currents will almost inevitably start to flow down the outer of the coax where it will get back to the shack and potentially cause all manner of problems.

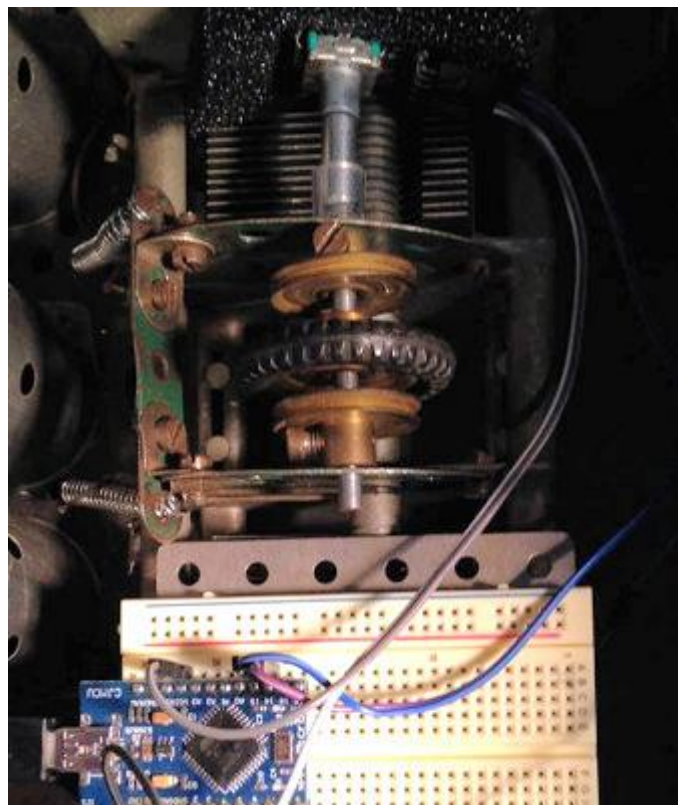
When the ATU provides a perfect match, the impedance seen looking back into it should be the complex conjugate (i.e. the opposite) of the impedance seen looking into the coax (not that at the antenna, unless the coax is exactly $\lambda/2$ and perfectly loss-free!) and any reflected power should then be bounced back to the antenna, but suffering another 6dB loss en-route. What then, if a manufacturer tells you that his antenna’s marginal SWR can be compensated for by an ATU in the shack? My advice is to avoid them, and anyone selling you one, like the plague. Next month, I’ll expand on that. **Ed.**

Marconi CR100 revisited

I was looking through some of the forums recently for information relating to my SDRPlay RSP-1 and the associated SDRUno software and came across this page: [http://hackaday.com/2016/11/06/a-vintage-interface-](http://hackaday.com/2016/11/06/a-vintage-interface-for-a-modern-radio/)
[interface-for-a-modern-radio/](http://hackaday.com/2016/11/06/a-vintage-interface-for-a-modern-radio/)



Basically, they have taken an old CR100 that was found on eBay and hacked it to make it work with a



RSP-1, an Arduino, some Meccano parts and a small Acer PC (bottom pic). They seem pretty pleased with their work and at least it gives the old boat anchor a new lease of life.

Comments on Hackaday's site seem to range from "nice one" to "sacrilege". Take your pick. Whatever else it has done, it has given the folks at SDRPlay something to think about and another talking point for Amateur Radio in general.

I'm all for playing these sorts of games... **Ed.**



Zurich DPS-2512 PSU unravelled

In the last issue I mentioned I was having problems with my PSU and that I couldn't, for the life of me, understand the circuit. After my appeal for help with this, Simon (Si) Giles, G4FDI volunteered to look at it remotely (as he lives in Dorset).

I sent him a copy of the circuit as I had traced it out and some pictures of the front and back of the boards along with a short description of its operation as I understood it. Now; some people are dyslexic, others innumerate, some can't tell left from right, some can't spell and with me, seemingly, it's up from down. Leastways, when I was actively involved in electronics and circuit boards I found that as soon as I turned the board over from component side to track side I would lose my place in the world. In the second or so that it took to turn the board over, my spatial awareness went to pot. Hence the reason for the following:

After a few back-and-forth emails, Si came back with several questions and pointed out I had made an error, in that I had left a ground off one of the variable resistors. As I was looking for the cause of my error, I spotted another component that I had also missed and then, with those omissions corrected, the circuit (and simulation) started to make sense.

It wasn't all plain sailing, as the simulator model eventually suffered from a high frequency mathematical oscillation that caused the run to take forever and effectively negate its benefits. By that time though, with Si's help, I had got a handle on the circuit and I understood what was going on. It was then obvious and I could only put it down to current mood and the fact that, once you "know" what you "know" you can't see the wood for the trees - a second pair of eyes really helps under those circumstances.

It doesn't really alter my opinion of the quality of the design, but there are a couple of aspects that I would never have dreamed of incorporating in a million years, although one is actually quite devious.

The main reservoir capacitors are only rated at 28V. The rectified a.c. is only 24V and, whilst the capacitors are never likely to be overvolted, they are sailing a bit close to the wind. The over voltage trip is not very clever. It could theoretically go to 15.6V (set by ZD2) and is likely to be influenced by all sorts of tolerance and bias current issues.

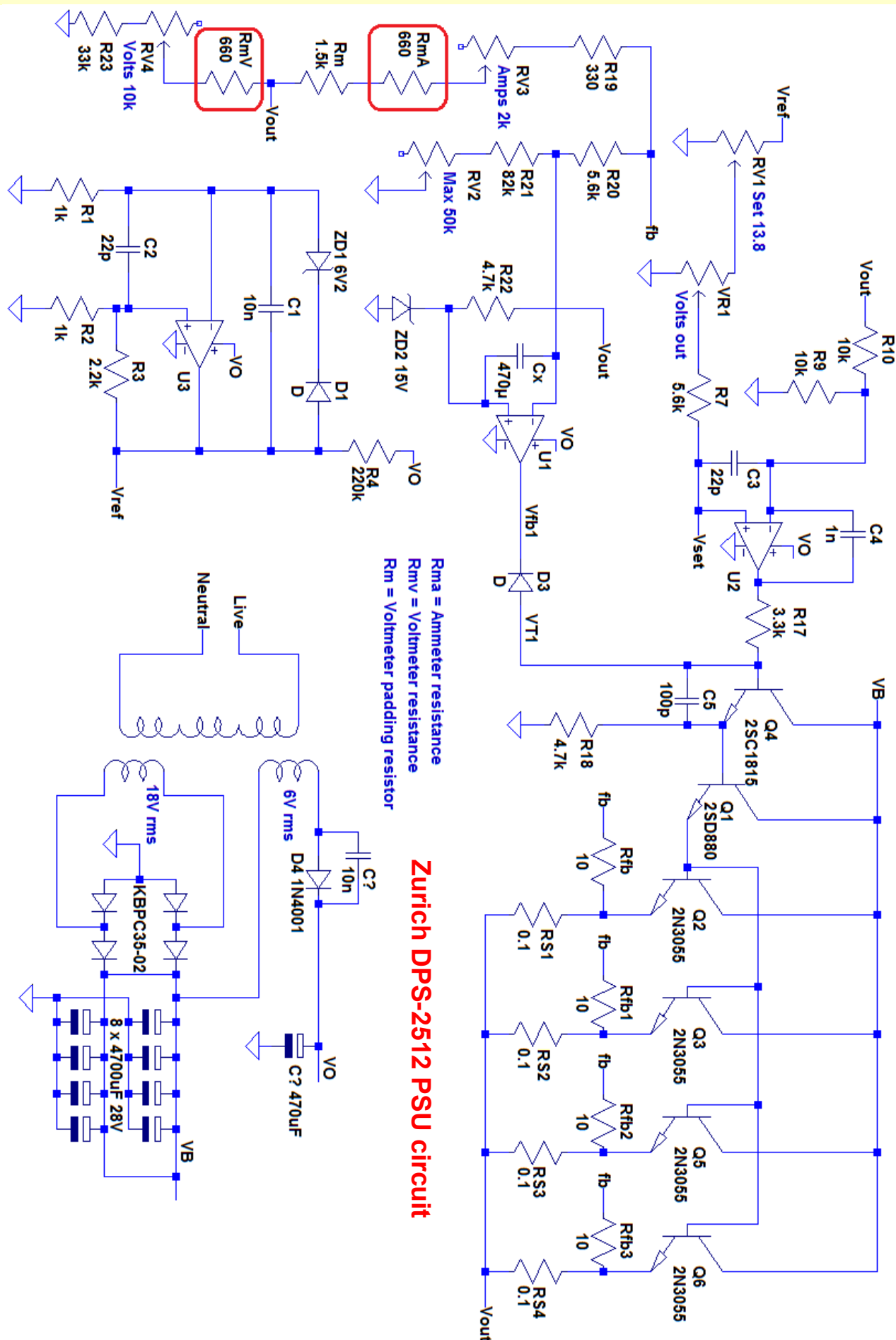
At a nominal output of 13.8V, the maximum theoretical current limit is 23A, set by RV2. If RV2 is set to that and the output voltage is less, say 10V, then that current limit is automatically reduced to about 17A. Mind you, if the output was at 10V, for any given current, more power would be dissipated by the output transistors - so that is a safety measure in its own right.

The voltage reference circuit is strange. When I first looked at it, I couldn't work out why there was positive feedback (R3) from the output to the non-inverting input and this was one aspect of the circuit that the simulator wouldn't initially replicate until I got the startup conditions right. R4 seems to be a pull-up to "start" the circuit and get it to a position where, in fact, the potential divider of R3 & R2 sets the operating point. The current drawn by D1, ZD1 and R1 then determine the negative feedback, and here's the clever bit:- the op-amp output sits at a voltage determined by ZD1, R1 and D1 (which helps thermal compensation) and the ratio of R3/R2. Because of this, the voltage across the Zener is stabilised by its own reference voltage, as the op-amp supply rejection ratio (PSRR) effectively removes the huge voltage variations in the supply with load (plus ripple voltage) and eliminates a couple more components that would otherwise come out of the Chinese parent company's profit margin. Fiendish...

Several of the connections (e.g. the transformer output) have ring tags soldered on them and then the solder tags bolted together in mid-air, which could lead to some resistance over time, and the PCB tracks are extremely thin under the power transistor and reservoir capacitor connecting boards, so they shave off a few pennies in areas that are likely to be most influential on performance. Strange.

Also, the meters are appalling. They have almost zero damping and the needles bounce like a jelly on springs when any conditions change. Si suggested damping them with a large electrolytic. A good idea, and I tried that, but it wasn't very effective, so I'll look for another solution.

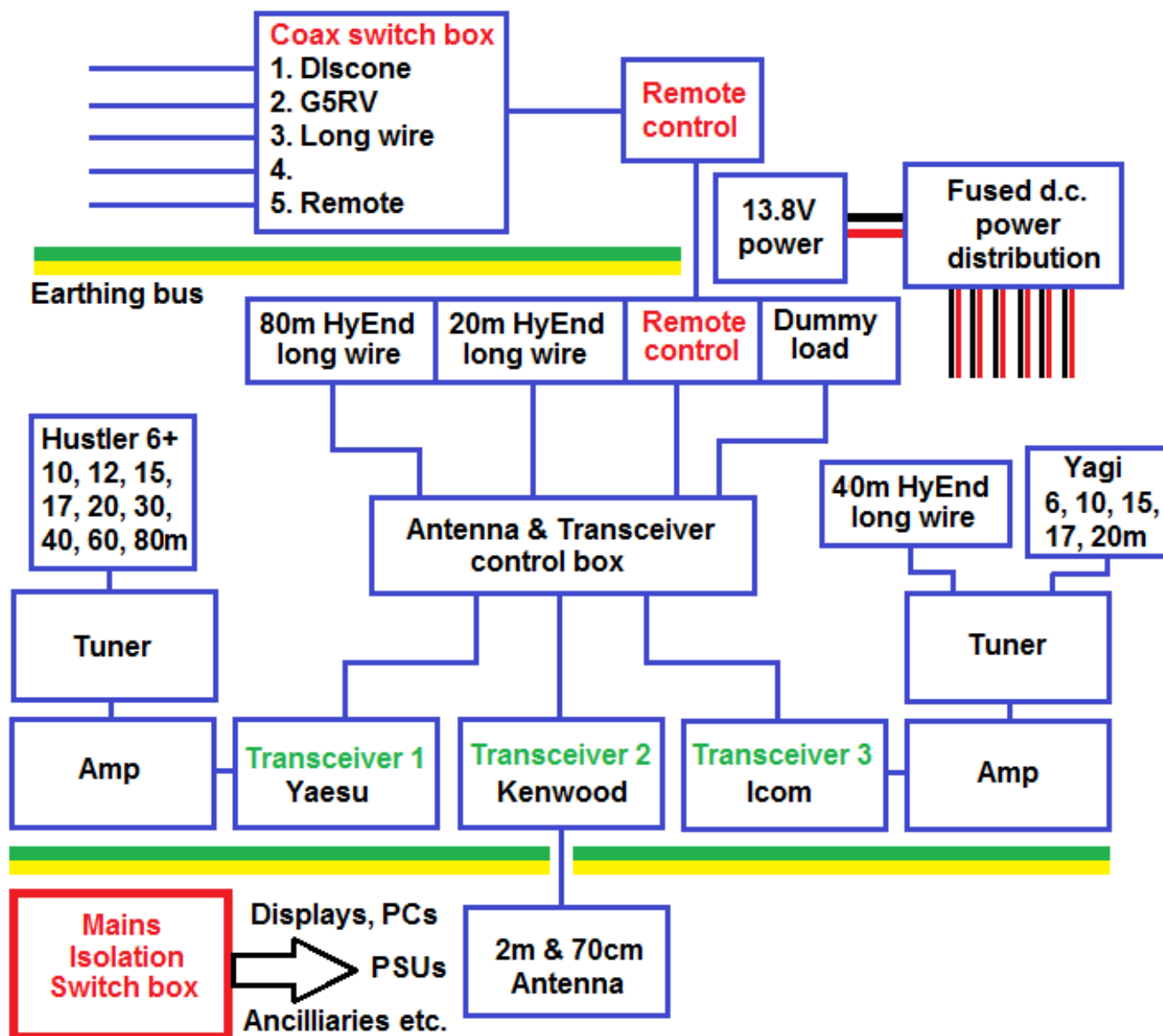
Thanks very much for your help, Si, it has been a pleasure to be on the receiving end of your thoughtful and thorough approach to problem solving. I'm very grateful indeed. - **Ed**.



Radio ~~Caroline~~ Helpline

Peter, MOPSD has been in touch recently after revamping his shack and is offering his services to any amateurs who would like to see how a well set-up shack operates and how effective different sorts of antenna can be in a wide variety of circumstances.

Many of you will know that Peter has had a spell of bad health recently, but he has overcome many hurdles and is now fighting back. He is kitting out his shack with the type and range of integrated equipment you might expect to find only within a main dealer's premises. An outline diagram is shown below.



Plenty of thought and planning has gone into the work and, whilst some of the equipment is high end indeed, Peter is very wise to the notion that there is no point in spending more money than you need to for equipment, tools or supplies, if unbranded items will do the job of well-known, but possibly overpriced items. He is very knowledgeable on this front and willing to demonstrate and impart the information.

Everything is ordered, labelled and routed to provide the optimum performance and ergonomics. From the Mains isolation and fusebox to the 100A, 13.8V busbar and fused distribution box to the antenna switches and relays, the PC USB and video cable routing - all is ordered logically.

The block diagram on the previous page shows an outline of how his shack and antenna farm is ordered. It is not comprehensive and there is much more that can be discovered by visiting Peter and his shack.



Granted, Peter has built pretty much all the infrastructure himself and it is that which allows him to fit everything into the space allotted (no small area in itself, in fact, but every square inch is fully utilised). The materials are carefully chosen and he has a good supplier, a fertile imagination and an extensive workshop - all of which he is willing to use in order to help those who may benefit from it.

The degree of equipment interconnection is pretty amazing and the way that a single program can be configured to control about 90% of it without manual intervention is certainly impressive. To some of you, possibly having worked in or experienced commercial environments it may not be a surprise, but it certainly opened my eyes to what could be done and if you don't have room or the readies to replicate what Peter has done (few will have) then it is certainly a rich source of ideas - even down to where, how and why you store your paperwork, equipment and tools.

He has a variety of antennas comprising collinear VHF/UHF, several long wires, both monoband and multiband, beams for HF, VHF & UHF, verticals and more besides. The shack layout is an exercise in compact, made-to-measure bespoke desk/shelving/racking holding all manner of items that are neatly laid out and ordered to provide optimum ease of operation and reduction of electrical noise. Having said that, Peter will use items off the shelf if they make his life easier. A example is an Ikea kitchen drawer unit that is nice and wide with cutlery inserts that he has re-purposed for holding all the common items for bench use like cutters, pliers, connectors, solder, etc.

As an example of the tips he has up his sleeve: when I (again) remarked on the extremely low band noise levels that Peter is experiencing compared to my QTH, he asked if I had a good antenna earth. I explained that it was earthed at the remote ATU which itself is only about a foot off the ground, and as well as I could manage in my circumstances. He then said that the receiver end of the coax had to be grounded and asked about the earth in my shack. I told him that the coax feeder was about 35m long and I had no ground in the shack at all, as it is on the first floor and any ground lead would act as an inductor and become ineffective (I've tried it). He then suggested an old radiator could be used as a counterpoise (as, indeed, Peter has done). It is an interesting notion and certainly not one I have ever considered.

A year or so ago I tried to find out why I had so much noise pickup in the shack and wandered around the house with a variety of search coils and a portable HF receiver. I expected the mains to be the main culprit but actually found that the vertical central heating pipes and, to a lesser extent, the radiators were the worst offenders. How do you fix that one? An isolated lump of metal may indeed help matters.

If you want to go along and talk about antennas, interconnections, auto-logging or remote control, it seems the kettle is always on and, if you are lucky, you may get to sample Peter's hospitality, kitchen wise. If you are *really* lucky, then Pauline may be persuaded to get out the cake tin! Contact Peter on m0psdradio@btinternet.com and arrange to go along. Whether you are a newly licenced operator looking to see how it is done or an old hand who hasn't yet got the hang of all this new-fangled digital stuff, I promise you won't be disappointed - **Ed**.



G4GHO Shack: 2MT?

If Peter can have his shack featured in the NL, then I can feature my 2m cube.

Some people don't want pictures of their shack published unless the hardware looks too tempting. As is evident from these, any undesirables would be better employed looking elsewhere. It's definitely too empty.

A major redecoration was required (not by me, I hasten to add) so I'm temporarily not QRV on any of the bands unless you count the Baofeng BF-F9 hand held, which won't get out of the street in my location... **Ed.**



Shack lighting – replace the fluorescent tube with a LED tube light

As another entry in my series “shack lighting” and following my love of LED lighting I thought I would show the CARS November meeting my twin light unit I had modified for LED tubes. A few members realised what was displayed. However, in reality, it may not be such a simple job – hence this article.

Fluorescent lights can be annoying – you go into a room and switch the light on and wait – flick – flick – ON!

Now, this “wait time” can be reduced by replacing the standard neon starter with an electronic starter - then you go into the room and switch on the light – wait 2 seconds and the fluorescent light comes ON – a much better arrangement.

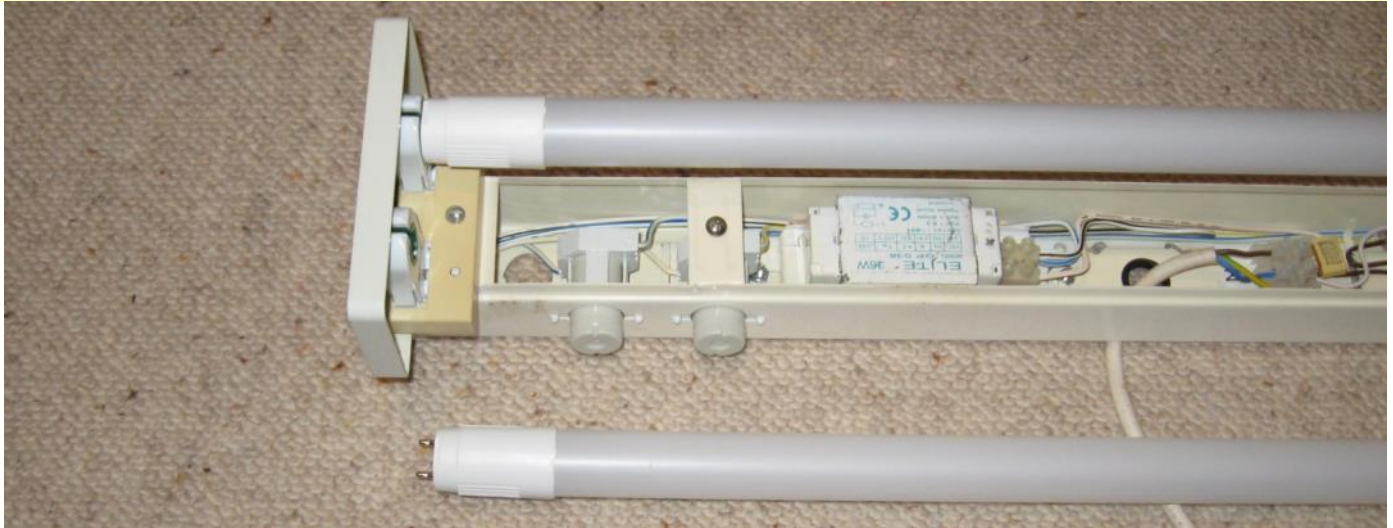
Alternately you can fit a high frequency ballast (does NOT need a starter) which enables the fluorescent tube to light in one second and reduces the possible “flicker effect headache” at the same time. This is particularly essential if you operate a lathe or similar rotating equipment.

LED Lighting is my preferred option – but, again, there are some pitfalls.

Looking on the internet I find there are a number of ways to do it which seem “hard work” and should be ignored. These include replacing the existing ballast and starter for a LED ballast; costs typically £12–£18, but could be used to feed up to 4 LED tubes in a multiple fitting. Another scheme is to fit a LED tube which has a LED starter built into one end – this model requires you to rewire the fitting to bypass the ballast and existing starter.

My approach is much simpler. I found that LEDHut supplied LED 2ft and 4ft replacement tubes complete with a replacement LED starter on a “one for one basis”.

For a single tube fitting – simply switch OFF and isolate the unit – remove the existing fluorescent tube carefully and the existing starter – insert the new LED tube – either way round – insert the new LED Starter – switch back ON. Job done. https://www.ledhut.co.uk/t8-18-watt-led-tube-light-36w-replacement-1200mm.html#product_tabs_review_tabbed



However, I had a twin 2ft unit. I ordered two LED tubes which duly turned up – fitted these and the new LED Starters as supplied into the unit – flick – flick – nothing!

Looking at my unit, it transpired my unit had a common Mains Ballast with a Neon Fluorescent Starter across each tube – a very common wiring scheme - which WILL NOT work with LED tubes. I had to rewire the unit to be two separate single tube units in the one fitting. It only needed a couple of cuts and re-terminations and the provision of two pieces of wire. These LED Tubes and LED Starters I purchased will work with the existing Mains Ballast in circuit or bypassed – I left mine in circuit.

It provides instant light on switch ON – plenty of it and can be ordered in Warm White (3,500k, a little orange for the shack) – Daylight (4,500k, preferred) - Cool White (6,000k, bit clinical and too white for many).

John, G8DET

That's quite interesting. Any LED lights I have are two-pin standard ES, BC or GU10 so, curious as to the nature of an "LED starter", I it [Googled](#) it and it seems it is likely to be just a direct short and Amazon sell the one pictured which has the simple annotation "FUSE". There are also reports out there on the interweb suggesting some punters have got replacements to work without any starter at all.



Eventually, the search led back to LEDHut's pages advertising the same tube as in John's link for £7.99, whereas John's link shows £13.99. It seems that you have to log in to see the prices (and I didn't want to create a log-in) but I wonder why the discrepancy. Oh - and John - did you get a "caution" label to warn other users that the fitting was suitable for LED replacements only? - Ed.

Remotes, LCDs, LEDs & reasoning

What is it with the rubber/silicone buttons on remotes, and other forms of electronic control equipment that require you to press one to change a function? You know that question you used to see popping up on those ghastly circular emails your less intelligent friends send you (*and ask you to send it to everyone you know*) "why is it when the batteries run down we press harder on the remote?"

You know the syndrome. It seems consistent with low batteries but often isn't the cause. The buttons in question have a form of conductive material moulded into the base of them where they contact and bridge a piece of copper track and, if it's a quality device, the track will be gold plated. Over the years I have had several that have failed. Mostly, you can get them to work again by dismantling the remote and cleaning either the board, or the button pad or both with something like meths or IPA (isopropyl alcohol, that is, not the beer). That is often effective for a while, so I guess that somehow a film of dirt gets into them. This may be due to dust or microscopic grease particles in the air or, possibly, having migrated around the keypad from your sweaty mitts (just look closely at your most used remote in daylight and tell me I'm wrong).

Anyway. I have had a couple now that have failed to respond to treatment or, at least, have done so initially and then failed to do so on a repeat occasion. I then conclude that something else is going on. Is the conductive material flaking off, or wearing out somehow? Whatever it is, I'm increasingly frustrated that consumer equipment seems to be going down the pan like this so easily.

Another thing - I have had a couple of LCD displays give up the ghost. Both of them intermittently, and seemingly not subject to an obvious fault. Most of these displays are made of a laminated glass with the liquid crystal sandwiched between them, and a conductive edge connector that is connected to the electronics by a compressible "zebra strip" that has alternate conducting and non-conducting elements and which is held in contact with the display by means of positive displacement and good tolerance on the mechanical fixings.

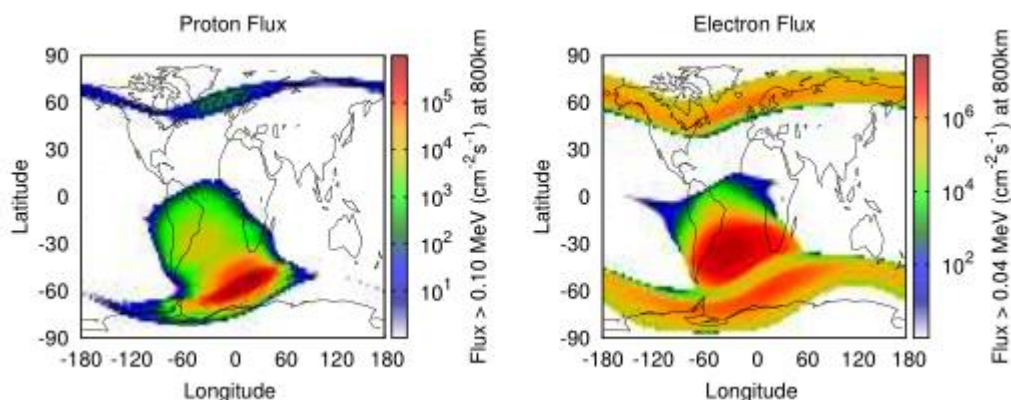
Sometimes, you can give this a nudge, or a wipe; other times, nothing seems to help. What gives?

Another thing that gets me is rotary optical encoders. You know the things; they appear on most bits of kit these days. One of the reasons for them being used is they are simple, the only moving parts are the optical disc and the shaft bearing and these should last almost forever. Why, then, do they fail, and what is the mechanism?

Essentially, they consist of an LED light source and a photo diode receiver. Granted, the light output from LEDs reduces with time and operating current, but the quoted lifetime of a photodiode is almost limitless. If the light output fails to operate the photodiode (not likely under normal circumstances and lifetimes) then why do they fail to work as they should? I have two that are giving trouble. One is the volume control on my Teac CR-H255 HiFi receiver and the other is the general function control in the Kenwood TS-570. The Teac's control works fine when rotated clockwise, but jumps mercilessly to virtually max volume when rotated anticlockwise. Fortunately, the remote control still works (and I've only had to clean that once to fix the radio presets not working). The TS-570's control also jumps; usually, but not exclusively, when operated clockwise. That one is not so much of an issue, as it mainly affects things like filter bandwidths, keyer speeds and other minor functions, but it could be a problem if I wanted to slowly adjust the power into something from its minimum output setting of 5W. I've not run into that one yet, though.

The symptom is not one of the perishing things not working - there is obviously some light transmission taking place; it's more that they are intermittent. Perhaps there is a dry joint around one of the pins. If so, it could explain the fault, but I imagine the logic should need to see all three pins operating correctly in order to work at all, as they usually work by edge detection and the direction of the control is usually sensed by which edge of the quadrature outputs moves first. I could probably replace the TS-570 control, but for the Teac, neither the control nor the board it's soldered to are listed as spares items in the repair manual.

Interestingly, whilst looking for clues as to what may be happening with the opto pair, I came across a document that suggested ways of improving the reliability and temperature stability of photo diodes for use in small satellite (Cubesat) applications. It refers to various (very) technical aspects - including that of radiation hardness - and is a nice example of the way you get to play with all sorts of lovely technology when assessing the effects of radiation upon satellite-based quantum experiments.



And to think that I had to work for a living - **Ed.** [Cubesat photodiode operation and lifetime analysis](#)